give a sufficient idea of all the rest of the essay. In conclusion, then, we must add that Mr. Ball's analysis as a whole appears to us to stagger the theory of use-inheritance more seriously than ever it has been staggered before; and, therefore, that no one who henceforth writes upon the subject can afford to disregard his treatment of the question, "Are the Effects of Use and Disuse Inherited?" GEORGE J. ROMANES.

TECHNICAL EDUCATION.

Manual Training in Education. By C. M. Woodward, A.B., Ph.D. (W.U.), &c. With Illustrations. (London: Walter Scott, 1890.)

THIS is in some respects a valuable work, and therefore it is the more to be regretted that its title is in a double sense misleading. A very little reflection would have taught the author that "manual," as from *manus*, the hand, means anything which hands are capable of effecting. He, however, defines "manual training" as limited to teaching and learning the use of tools and working materials; these, according to his system, being limited in turn to wood and metal work, such as turning, carpentry, and smithing. The immense range of work of which children are capable is not included, therefore, in "Manual Training." Again, we find in the book that the education in question not only does not include that of girls, but actually takes no note of young children of either sex. "Starting with boys in their teens," Prof. Woodward shows, what has always been well known, that such boys can be taught the rudiments of certain "trades." But as the very great majority of children leave school early in their teens to go into active life, what parents or the public chiefly wish to know is, what manual training can be imparted to all children while they are yet at school? Extensive experiment has perfectly shown that they can be taught to draw, model, and execute much useful art work even from six years of age, and what is of more importance is that, as one hour of sleep before midnight is worth two after it, so those who learn to draw in early childhood acquire a certain dexterity and skill such as is rarely, if ever, attained after thirteen years of age. "The proper mental maturity," says Prof. Woodward, "rarely comes before the fourteenth year. I think of the class as about fifteen years old." "The minimum rate of admission" (to my school) "is fourteen years"—meaning, we suppose, that no younger pupils are received. If this means anything, it is that, according to the author, manual training in education should not begin till "the proper mental maturity" is attained. But what we expect from education is that pupils shall be trained *before* their minds are matured.

There are many persons who will buy this work under the impression that it will teach all the details of manual training. But, in fact, of its 310 pages only 77 are devoted to practical instruction in drawing, wood and iron work. These are truly excellent of their kind, so much so that we cheerfully wish *si sic omnes*—"would that all were like it"—since in that case we should have had a work of practical use, although there is at present no lack of admirable if not better hand-books for such training in England. In the remaining part of the book Prof. Woodward advances theories which no man of culture and intelligence can admit, and which imperatively call for refutation, since at present the British public in its bewilderment as to "technical education" is being extensively deluded by them.

It has been said by some journalist that the aim of the Socialists seems to be to make of all society a well-organized poor-house. It is not in the least an exaggeration to say that Prof. Woodward's idea of education is that every male in a community shall be, first of all, a mechanic. He admits, it is true, a moderate amount of culture in literature and other branches, but exacts that *three hours a day* shall be given to drawing and manual labour, while with boys above fourteen it may be more. That is to say, three hours in school, with two hours of home study, are to be given to mathematics and book-keeping, science (*i.e.* geography, zoology, botany, chemistry, physics, physiology) and literature (which is to include "some choice specimens of modern prose and poetry"), and *one* foreign language—French, German, or Latin. But it is very evident that Prof. Woodward considers that in all cases, with every pupil, the manual labour should be the most thoroughly taught, and that carpentry and metal work are of paramount importance. The main force or tendency of all education should be to form a mechanic, and give to every youthful mind the habit of regarding all things from a mechanic's point of view.

Now, while this is a commendable education for a blacksmith, and while we may admit that it amuses and pleases youth, it is evident "on the face of it" that the literary course prescribed is utterly inadequate to *properly* prepare pupils for any career above that of the workshop. And this tone pervades the whole book: "there's nothing like leather" appears on its every page. The author quite forgets, what is also left out of sight by most of our own reformers in education, that, absolutely necessary as it may be to educate the majority to become mechanics, the world requires a very respectable number of professional, literary, and really scientific men, who could not be properly trained for such pursuits on one language, even with a knowledge of "some choice specimens of *modern* prose and poetry."

It is true that the author admits that, when "a lack of mechanical interest or power" manifests itself, the lad should unquestionably be sent to his grammar and dictionary rather than to the laboratory and drafting-room." That is to say, when the bit of wood is fit for nothing else we may make a god of it. And a master mechanic is to decide as to who shall thus take the back seats in education, and occupy the inferior positions of men of science and literature!

There is a class of boys, according to Prof. Woodward, "who are so constituted that their controlling interests are not in the study of words, the forms of speech, or the boundless mass of information which is given in books." These appear to be his favourites. "The claims of this class of boys," he asserts, "have been set forth by no one so eloquently as by General Francis A. Walker." It may interest the reader to see what is regarded as surpassing eloquence by one who prescribes the limits of all literary education.

"It not infrequently happens that the boy who is regarded as dull because he cannot master an artificial

© 1891 Nature Publishing Group

system of grammatical analysis, who isn't worth a cent for giving a list of the kings of England, who doesn't know and doesn't care what are the principal productions of Borneo—has a better pair of eyes, a better pair of hands, a better judgment, and even by the standards of the merchant, the manufacturer, and the railroad president, a better head than his master."

The reader has possibly heard such brilliant eloquence at a certain class of popular meetings, where the assertion that the ignorant and book-hating man is the cleverest in the community is always received with cheers. Prof. Woodward himself asks if there "may not be something mischievous in the power of attention to certain book-learning, as shown by the tendency of bookish people to dislike manual labour, and sometimes to become bad citizens?" It is evident enough that "bookish people" do not stand high in his graces. He assures us that his manual education is carried on in the interest of rational intellectual training and culture, but we confess that we fail to see it. These extracts indicate exactly what his standard of "culture" must be. Indeed, he declares that his system, far from being too narrow, is rather too broad.

We cordially believe that Prof. Woodward is an accomplished, skilful, very earnest and successful teacher of wood and metal work to boys over fourteen or fifteen years of age, but we have rarely met with a writer who needed more the caution not to go beyond his last. His work is to all intents and purposes inspired with the belief that all schools should be like his own, and all education for all classes be based on the very limited mechanical training with which he is familiar. That it is admirable to a certain degree, but most inadequate to all the demands of a really good education, is apparent on every page. As he handles all his adversaries without gloves, sparing no one who does not believe his method of education to be perfection, we have the less scruple in setting forth the truth regarding it in plain words. Singular as it may seem, not only to him, but to a great number of reformers, the education of the future will require a much higher stimulant or a far better basis than mere mechanical drawing, hammering, and filing.

OUR BOOK SHELF.

Monographie der baltischen Bernsteinbäume: Vergleichende Untersuchungen über die Vegetationsorgane und Blüthen, sowie über das Harz und die Krankheiten der baltischen Bernsteinbäume. Von H. Conwentz. Pp. 151, mit achtzehn lithographirten Tafeln. (Danzig. London: Williams and Norgate, 1890.)

DR. CONWENTZ was long associated with Goeppert and Menge in the investigation of the "Amber Flora," and indeed wrote the whole, or nearly the whole, of the second volume of the "Flora des Bernsteins," comprising the angiospermous fossils found in Baltic amber. Engaged upon a third volume of this work, devoted to cryptogamous or spore-bearing plants, Dr. Conwentz became impressed with the necessity of first working out the relationships of the trees which yielded the resin now found in a fossil state and known as amber, and those who know the admirably executed plates and exhaustive text of the two volumes issued of "Die Flora des Bernsteins" will not be disappointed with this companion volume.

We cannot attempt a critical review of this work, and must therefore be content with giving the result of Dr Conwentz's investigations, as set forth by himself. During the Tertiary period the division or distribution of land and water, especially in Europe, was very different from what it is at the present time; and in Eocene times, the beginning of this period, the Scandinavian continent extended southward nearly to the Samland district of northern West Prussia and Mecklenburg, and supported a vegetation whose principal types now characterize the flora of the southern parts of the temperate zone and the northern subtropical zone. Evergreen oaks and beeches flourished, associated with palms, laurels, magnolias, and camellias; also the amber trees and various kinds of cypress.

Chief among these amber trees were four species of *Pinus*, not one of which was very closely related to *Pinus sylvestris*, the characteristic fir or pine-tree of the region of the present period. One of the species, with leaves or needles in pairs, recalls some of the North American species belonging to the section *Parrya;* a second resembles the Japanese *Pinus Thunbergii;* and a third, having the leaves in fascicles of five, is near *P. Cembra* and the Japanese *P. parviflora.* In addition there was a kind of spruce more nearly allied to *Picea ajanensis*, of the extreme east of Asia, than to the silver spruce of Germany.

It is probable, Dr. Conwentz believes, that all these different trees and shrubs did not form a mixed forest, but were peculiar to separate regions, and then the amber trees formed dense forests interspersed here and there only with other trees. Dr. Conwentz pictures the conditions under which he imagines these amber trees existed and discharged the resin now so universally employed. The trees he assumes were exposed to the ravages of almost numberless enemies, animal and vegetable, insomuch that there was scarcely a sound tree in the forests. The trees thus enfeebled would be swept down or mutilated by violent storms, causing an abnormal exudation of resin. It seems, however, hardly necessary to insist on the general unhealthiness of the trees to account for the large deposits of resin. Clouded amber is said to be due to the presence of cell-sap in the resin. The majority of the plates illustrate the destruction of the tissues by various fungus parasites. W. B. H.

The Birth and Growth of Worlds. By A. H. Green, M.A., F.R.S. (London: Society for Promoting Christian Knowledge, 1890.)

THIS little work is the extension of a lecture delivered by Prof. Green. It contains an account of various cosmical theories from 1684, when Thomas Burnet, D.D., a learned divine, expounded his "Sacred Theory of the Earth," to recent times. The researches of Prof. Lockyer on the constitution of the heavenly bodies are well described; as are also the hypotheses of Kant and Laplace. A list is given of the chief works bearing on the subject of the lecture. This, in conjunction with the descriptive text, and a few well-chosen illustrations, renders the book extremely useful as a popular short exponent of the many attempts that have been made to fathom the origin of celestial species.

Chambers's Encyclopædia. New Edition. Vol. VI. (London and Edinburgh: W. and R. Chambers, Ltd., 1890.)

THE present volume of the new edition of Chambers's well-known "Encyclopædia" takes in words ranging from "Humber" to "Malta." In every respect it is up to the level of the preceding volumes; and, as usual, scientific subjects have been entrusted to thoroughly competent writers. Under "Hydrophobia" M. Pasteur sketches his discoveries and practices in regard to rabies, while Mr. J. Arthur Thomson contributes "a brief unargumentative review of current adverse criticism." There is an excellent article on insanity by Dr. T. S. Clous-

© 1891 Nature Publishing Group